The Delphi Process in Dental Research

Carl K. Cramer, DMD, MSc
Clinical Assistant Professor, Department of Oral Biological and Medical Sciences, Faculty of Dentistry, University of British Columbia

Gary D. Klasser, DMD, Cert Orofacial Pain
Assistant Professor, Department of Oral Medicine and Diagnostic Sciences, College of Dentistry, University of Illinois at Chicago

Joel B. Epstein, DMD, MSD, FRCD(C), FDSRCS(Edin)
Professor and Head, Department of Oral Medicine and Diagnostic Sciences, College of Dentistry, and Director of the Interdisciplinary Program in Oral Cancer, UIC Cancer Center, College of Medicine, University of Illinois at Chicago

Samuel B. Sheps, MD, MSc, FRCP
Professor, Department of Health Care and Epidemiology, Faculty of Medicine, University of British Columbia

Objective: To explore how Delphi formal consensus procedures may augment decision making in oral health care in the absence of high-quality clinical and epidemiological data. **Methods:** A review and appraisal of the literature regarding the Delphi method was conducted using Medline databases and Google. **Results:** The Delphi method has a long history that highlights both its strengths and limitations. Delphi uses a series of anonymous questionnaires designed to develop a consensus of opinion and can provide guidance on topics that have not or cannot be studied in randomized controlled trials. The Delphi technique has been used to achieve consensus of opinion on a variety of issues including those related to oral health. Guidelines for the use of Delphi are presented. **Conclusion:** Like any other research methodology, the process guidelines need to be systematic and comprehensive. Delphi expert opinion consensus may improve decision making in a wide variety of oral health circumstances.

INTRODUCTION

Many important clinical issues do not yield to randomized clinical trials or to stepwise quantitative data analysis. In such cases, professionals use their training and personal anecdotal experience to assist decision making in a variety of practice contexts. In these circumstances, consensus opinion of experts provides a formal structured process for decision support and enhanced potential external validity. Consensus procedures also use the resources of all participants, commit them to the project, and enhance the future decision-making ability of the group with regard to resolution of the clinical problem addressed.[1]

Formal consensus methodology theorists argue that opinions of experts generated through structured circumstances can generate a closer approximation of the objective truth than would be achieved through

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conventional, less formal, pooling of expert opinion. The methods include the nominal group technique,[2] the Delphi technique,[3] the Glaser "state-of-the-art technique,"[4] a model developed and sometimes used by the National Institutes of Health,[5] and a model used by the Agency for Healthcare Research and Quality.[6] The "Delphi technique" and the "nominal group technique" are the 2 methods with the longest history.[7] This article will discuss the Delphi method because it provides anonymity to study participants and has been found to produce more frequent and stable consensus when compared with the nominal group technique.[8]

Delphi is described as a structured group communication process that allows a clinical or other decision-making group to resolve complex problems with the goal of producing useful guidance and opinions for decision makers, especially regarding qualitative data in areas where "hard data" are difficult to obtain.[9-11] Delphi technique refines expert opinion data through consideration of anonymous input from other peer experts, generating a considered consensus over repeated applications. Advantages over the nominal group include anonymity of responses, which should minimize potential personal intimidation bias that may be demonstrated with empanelled findings, and also lack of need for geographic proximity of participants.[12,13] The objective of this article is to provide an introduction and to explore the Delphi technique and its potential applications in oral health research. Such an exploration will be of interest to both researchers and more importantly to practitioners who have been or may be invited to become involved in the Delphi process.

METHODS

Medline and Google searches for articles dealing with Delphi methodology were conducted using search terms Delphi, consensus, methodology, decision support, clinical decision making, clinical guideline development, methodology, and related without age limit since much Delphi theory is decades old. Delphi studies in health sciences dated before 2000 were sampled; those 2000 onwards in dentistry were carefully considered.

RESULTS

The Delphi method or process was first developed at the RAND Institute as an alternative to developing complex computer models of effects of Soviet weapons systems.[9] It was thought that expert consensus would be a more practical way of synthesizing known and purely subjective data. Nonmilitary applications of Delphi were first published in the 1960s.[9] Health services research and policy applications became relatively common in the 1970s and occasional articles employing the Delphi methodology on medical issues also appeared.[11,12]

The Delphi technique has also been used to achieve consensus of opinion on an array of oral health issues. Examples include using Delphi to assess the outcomes of periodontal therapy, implants, osteonecrosis, or radiological diagnosis; pedodontic referral criteria and indications for radiography; and criteria for replacing amalgam restorations or placing removable partial dentures. Delphi has also provided decision support for diagnosis and management of patients, assessed current and future trends in clinical dentistry, and suggested a research agenda necessary to achieve an epidemiological database necessary for a clinical guideline. Table 1 summarizes publications from 2000 onwards that use the Delphi process with regard to oral health issues.

Delphi Methodology

General characteristics of the Delphi technique as described by Pill[13] and Whitman[14] include anonymity of responses, multiple iterations with controlled feedback, and statistical summaries. Typically, an open-ended survey is sent to invited experts who in turn provide responses that allow the Delphi experimenter to frame items for subsequent close-ended surveys. Each subsequent survey will incorporate statistical summaries of item responses from the previous version so that respondents can compare these with their own thoughts. The most frequently selected options or opinions from a list may continue to the next round, leading to convergence of opinion towards consensus. Each open- or close-ended version of survey items is termed an "iteration" or a "round." Responses to subsequent rounds tend to converge toward consensus, or relatively rarely, bimodal distributions. The goal is to achieve at least a 70% response rate in each round.[15] The Delphi technique is well suited for use on the Internet because of the rapid communication of Delphi rounds resulting in reduced cost and time of collection for data analysis.

Delphi methodology is art as well as science[9] so the Delphi methodology outlined in this article may not apply to all situations. A relevant question of suitable complexity for the Delphi process on a topic of practice importance and for which there is demonstrated need for consensus information must be developed carefully, providing participants with a well-defined set of choices. Fink et al[7] recommend that desired consensus levels should be defined in advance of a study. (Consensus levels in the literature range between 51% and 80% [in many cases using a bench mark of 70%], depending on sample size and the characteristics of the study and iteration.[16]) There also should be prior definition of the minimum acceptable levels of confidence in responses that are adequate for items to be carried forward to the next round, and of minimum acceptable confidence levels for final opinions.

TABLE 1. Summary of some recent Delphi publications in oral health, grouped by subject area

Publication	How Delphi Was Used	Conclusions
A. Clinical Issues		
Cramer CK, Epstein JB, Sheps SB, Schechter MT, Busser JR. Modified Delphi survey for decision analysis for prophylaxis of post-radiation osteonecrosis. Oral Oncol 2002;38:574-583.	Epidemiological data necessary for formal clinical decision making for preventing osteo-radionecrosis were sought in the literature and through a 2.5-round modified Delphi process.	Treatment planning factor deficiencies (particularly in frequency data and expert estimates of same) were noted. A research agenda to remediate these deficiencies was advocated.
Heydecke G, Penrod JR, Takanashi Y, Lund JP, Feine JS, Thomason JM. Cost-effectiveness of mandibular two-implant overdentures and conventional dentures in the edentulous elderly. J Dent Res 2005;84:794-99.	Oral Health Impact Profile-20 and costs for mandibular conventional dentures and 2-implant overdentures in elderly subjects were measured up to 1 year post-treatment, then compared; data for subsequent years were estimated by Delphi.	Two-implant-supported mandibular overdentures increased Oral Health-Related QOLife by 33%, or about 1 SD, relative to conventional dentures, for a reasonable extra cost of $226/year.
Lightfoot WS, Hefti A, Mariotti A. Using a Delphi panel to survey criteria for successful periodontal therapy in anterior teeth. J Periodontol 2005;76:1508-12.	Delphi panel experts assessed the level of importance of attachment level, probing depth, mobility, plaque, inflammation, esthetics, pain, and patient satisfaction as outcomes following periodontal treatment of a single tooth or multiple anterior teeth in a patient with severe chronic periodontitis.	Minimally acceptable outcomes necessary for clinical treatment "success" were determined, the primary ones being an attachment gain of 2 mm remaining stable for 5 years.
Owen CP. Guidelines for a minimum acceptable protocol for the construction of complete dentures. Int J Prosthodont 2006;19(5):467-74.	To obtain consensus on the prosthodontic principles to be followed when constructing complete dentures, since no level of evidence higher than expert opinion is available.	A minimally acceptable protocol of 18 statements with 90% or greater agreement was obtained after a 3-round modified Delphi.
Randall RC, Vrijhoef MM, Wilson NH. Current trends in restorative dentistry in the UK: a Delphi approach. J Dent 2002;30:177-87.	Nine experts piloted and refined a series of Delphi statements on trends in restorative dentistry in the UK; 23 refined statements were sent to 407 UK dental school faculty, then returns were analyzed.	Two statements scored high agreement (≥90%), another 15 of the 23 reached the predetermined desirable level of consensus (≥70%). Moderate levels of agreement (<70%, >> 50%) were obtained on the balance of the questions.
Rothfuss LG, Chaffin J, Luciano WJ, Finstuen K, Mangelsdorff D. Digital dental radiography needs assessment utilizing the Delphi process. Gen Dent 2005;53: 147-153.	(1) Dentists and (2) Information Management/ IT specialists produced and separately rated dental radiography-related needs for the army, using Delphi statements with a 7-point bipolar scale.	The 2 groups established and ranked their needs regarding architecture and equipment (radiographic, and computer network). These differed, and both sets of requirements needed to be met.
Svedstrom-Oristo AL, Pietila T, Pietila I, Helenius H, Peutzfeldt P, Varrela J. Selection of criteria for assessment of occlusal acceptability. Acta Odontol Scand 2002;60:160-6.	A modified 3-round Delphi process involving orthodontic and stomatognathic physiology experts selected morphological and functional criteria for an acceptable occlusion.	A consensus on necessary outcomes for an acceptable occlusion was realized. This may enable better future comparisons of the effectiveness of various treatment approaches. Etc.

(Continued)

TABLE 1. *(Continued)*

Publication	How Delphi Was Used	Conclusions
Umadevi M, Adeyemi O, Patel M, Reichart PA, Robinson PG. (B2) Periodontal diseases and other bacterial infections. Adv Dent Res 2006;19:139-45.	A crude Delphi approach addressed 6 questions related to the diagnosis and pathology of gingivitis and periodontitis in HIV patients.	More epidemiological research is necessary to answer 5 of the questions posed. Altered pathogenesis for the progression of periodontal disease in HIV patients was hypothesized.
Wostmann B, Budtz-Jorgensen E, Jepson N, et al. Indications for removable partial dentures: a literature review. Int J Prosthodont 2005;18:139-45.	A modified Delphi process assessed indications and contraindications for the prescription of removable partial dentures, and their key design features.	Major principles for partial denture decision making were identified.
B. Educational Issues		
Best HA, Messer LB. Effectiveness of interventions to promote continuing professional development for dentists. Eur J Dent Educ 2003;7:147-53.	The quality-related effectiveness of 2 competing continuing education interventions in changing dental practice were assessed and compared.	The more effective continuing education strategy was identified.
Dolan TA, Lauer DS. Delphi study to identify core competencies in geriatric dentistry. Spec Care Dentist 2001;21:191-7.	Competencies and core knowledge, skills, and values needed for dental school graduates to meet the oral health care needs of older patients were assessed using a slightly modified 2-round Delphi.	Good consensus was found on competencies and core knowledge, skills, and values necessary to meet the oral health care needs of older patients.
Fried H, Leao AT. Using Delphi technique in a consensual curriculum for periodontics. J Dent Educ 2007;71(11):1441-6.	Topics relevant to teaching an undergraduate Brazilian program in periodontics were rated in importance over 4 Delphi rounds.	Seven topics necessary for a curriculum were identified using input from periodontics lecturers.
Hand JS. Identification of competencies for effective dental faculty. J Dent Educ 2006;70:937-47.	Dental education experts used Web-based Delphi process to assess skills, abilities, and competencies necessary for effective dental faculty.	Consensus competency statements for effective (1) clinical teachers, (2) clinical scholars, and (3) research-intensive scholars were produced.
Patrick T. Assessing dental hygiene clinical competence for initial licensure: a Delphi study of dental hygiene program directors. J Dent Hyg 2001;75:207-13.	Directors of 44 (19% of the total) US dental hygiene schools participated in a 3-round Delphi process to establish a necessary clinical competence for initial licensure.	About half of the initial clinical competency statements reached consensus approval after 3 rounds. Ongoing clinical process evaluations were thought superior to one-shot evaluations.
C. Policy Issues		
Chestnutt IG, Taylor MM. Prioritisation of research recommendations from a national needs assessment programme. Health Bull (Edinb) 2000;58:396-402.	Sixteen of 17 Scottish dental public health consultants ranked 54 recommendations from Scottish Needs Assessment Program reports using a 2-round Delphi process.	Recommendations were prioritized and will inform future oral health research needs.

(Continued)

TABLE 1. *(Continued)*

Publication	How Delphi Was Used	Conclusions
Ireland RS, Jenner AM, Williams MJ, Tickle M. A clinical minimum data set for primary dental care. Br Dent J 2001;190:663-7.	Stakeholder organized dentistry representatives ranked existing clinical indicators that collectively aim to summarize the oral health of a patient, in relation to their perceived importance to oral health.	Thirty-eight indicators of oral health were ranked for importance: first dental pain, second untreated caries, and so on. This data set would aid information management. Information gathered in relation to this set of indicators would assist outcome comparisons among different sets of providers.
Jones JA, Boehmer U, Berlowitz DR, Christiansen CL, Pitman A, Kressin NR. Tooth retention as an indicator of quality dental care: development of a risk adjustment model. Med Care 2003;41:937-49.	Studies comparing the quality of dental care with endodontic or exodontic treatment would be biased if they did not incorporate a disease-severity standardization process. Three models for accomplishing this, one of them involving modified Delphi, were compared using logistic regression.	The quality of the Delphi was approximately equal to the better of the other two methods. Use of this risk adjustment model should be considered in future studies of the quality of dental care that involve these treatment modalities.
Jones JA, Brown EJ, Volicer L. Target outcomes for long-term oral health care in dementia: a Delphi approach. J Public Health Dent 2000;60:330-4.	A 3-round Delphi was used to produce a list of target outcomes for long-term oral health care for persons with dementia.	Family and professional caregivers consistently identified 10 top outcomes. Widespread acceptance for these is advocated.
Kearney-Mitchell PI, Milsom KM, Blinkhorn AS, Tickle M. The development of a consensus among primary care dentists of referral criteria for school dental screening. Br Dent J 2006;200:509-12.	A 2-round Delphi was used in NW England to establish levels of support for inclusion of 10 school dental-screening referral criteria for further treatment.	Caries, darkened incisors, 9- to 10-year-olds with overjet of >10 mm; gross plaque or calculus or swollen gums, sepsis, and caries in the permanent dentition in children registered with the GDP, were agreed-upon criteria for referral for further care.
Palmer N, Batchelor P. Informing research in primary dental care: setting priorities. Prim Dent Care 2006;13:85-90.	UK research priorities for research in primary care were assessed using Delphi.	Five priority areas were identified.
van der Sanden WJ, Mettes DG, Plasschaert AJ, Grol RP, Verdonschot EH. Development of clinical practice guidelines: evaluation of 2 methods. J Can Dent Assoc 2004;70:301a-h.	The effectiveness of a "top-down" 2-round national Delphi process involving 2 panels of 8 general dentists and 2 oral surgeons were compared with the results from a "bottom-up" consensus of 2 local peer general dentist groups (the latter being hypothesized by others to further the acceptance of the guidelines).	Outcome measures for the development of clinical practice guidelines were (a) time invested and (b) the quality of the guidelines using the "Appraisal of Guidelines for Research and Evaluation" indicator and group discussions. The national Delphi processes achieved better outcomes than the existing local dental peer groups.

Experts should be selected carefully for expertise and apparent objectivity.[16] The numbers of initial participants should be sufficient to permit drop-outs and still complete all rounds with adequate numbers of participants. Conventional letters of invitation are usually accompanied by an outline of the proposed study and an informed consent form.

Expert respondents' personal characteristics such as the amount of training after professional school, specialization, age and graduation time, and institutional factors such as the size of the organization, volume of clients, and availability of programs or facilities could influence a practitioner's range of experiences and bias their opinions or behavior.[17-19] Therefore, these characteristics may be identified in a separate biographical part of the round 1 Delphi survey, perhaps following the core content in order to be less intimidating and decrease possible bias, and should be taken into account during analysis.

Delphi Implementation

The implementation of the Delphi Process is illustrated in Figure 1. After a final review of the literature relevant to the research question, the Delphi first iteration open-ended questions are posed in the round 1 survey asking experts for opinions about the range of information relevant to the research problem. Ranking or rating may also be requested, as with a Likert scale ranging from 1 ("Not At All Important") to 5 ("Most Important"). Hasson et al[16] suggest that focus groups may also be used to generate open-ended data. The preliminary survey or question is set, then piloted with a few volunteers, and refined if needed. The piloted first-round surveys are distributed. After reminders to participants to return their first-round responses, the data may be analyzed using conventional qualitative research approaches for coding and analysis of themes.[20,21] One-off raw data (factors or comments mentioned by a single respondent) may be discarded unless they raise further important issues that are worth pursuing. These qualitative analytic results will permit the framing of close-ended items of high content validity for subsequent iterations of the Delphi survey. Respondents may also suggest additional topics for consideration on subsequent rounds.

"Round 2" items with a well-defined set of choices are often framed in the first person to remind the experts that they are referencing their own opinions as they answer. Respondents indicate their agreement level with the statement in one Likert scale and, in most case, their degree of confidence in their answer in a separate Likert scale.[22] (Expert confidence in answers is considered a surrogate for the quality of these data.[21]) Examples of one type of round 1 and round 2 items are provided in Figure 2. Information return may be maximized when Delphi declarative statements are about 20 to 25 words for clinical events of general familiarity.[23]

The round 3 survey is developed after review of round 2 survey choices, removing items indicated as inappropriate (ie, below the chosen cut-off), and production of statistical summaries of the remaining items.[10,11,16] Those items for which adequate consensus was immediately obtained should be noted as no longer requiring further response, and are thus often omitted from the subsequent round to reduce the item set that requires further consensus. It should be noted that consensus on items with bimodal distributions may not resolve over subsequent rounds, and may be a legitimate outcome of a Delphi survey because such items may indeed reflect reality for the respondents.[24]

Respondents consider the average group response and their own feelings and decide whether to stand firm or defer to the developing consensus. Subsequent rounds may be indicated until interquartile ranges are minimized and responses center around stable values.[11,25,26] Differences between rounds also can be assessed using Spearman Rho rank correlation coefficients[27] or chi-squared tests.[28] Sufficient consensus may limit the number of rounds needed if previously identified end points are achieved.

Classical Delphi technique seeks to identify and characterize important parameters by expert consensus. The policy Delphi does not aim to reach consensus but to establish the range of possible differing positions.[24,29] Particular circumstances and research questions might suggest variation in panel size and selection, questionnaire design, the number of rounds, the form of feedback, and the analytic strategy used, as explained in Passig.[30] Likert scales may be replaced or supplemented with other scoring methods such as an opportunity to define event timing or the distribution of probabilities of outcome.[24] However, some authors caution that modifications of the original concept may endanger the original theoretical justifications for the process.[29] Graham et al[31] and Hahn and Reyens[32] present detailed examples of classical Delphi and policy Delphi procedures.

Overall, the Delphi process is described as a versatile and relatively robust methodology. It allows for participation without geographic, and to a lesser extent, temporal constraints. It also allows for anonymity in participation, which is believed to reduce bias from defense to the more prestigious or multiple members of a panel.[7,11]

DISCUSSION

The original concept of Delphi proposed by Dalkey[33] is one in which experts most confident in their opinions tend over subsequent rounds to move the group median toward the best answer.

Rowe et al[10] provide evidence that there is a general trend toward more valid judgments with multiple iterations, but suggest that participants also tend to produce more valid judgments over rounds even in the absence of additional information from others. They conclude

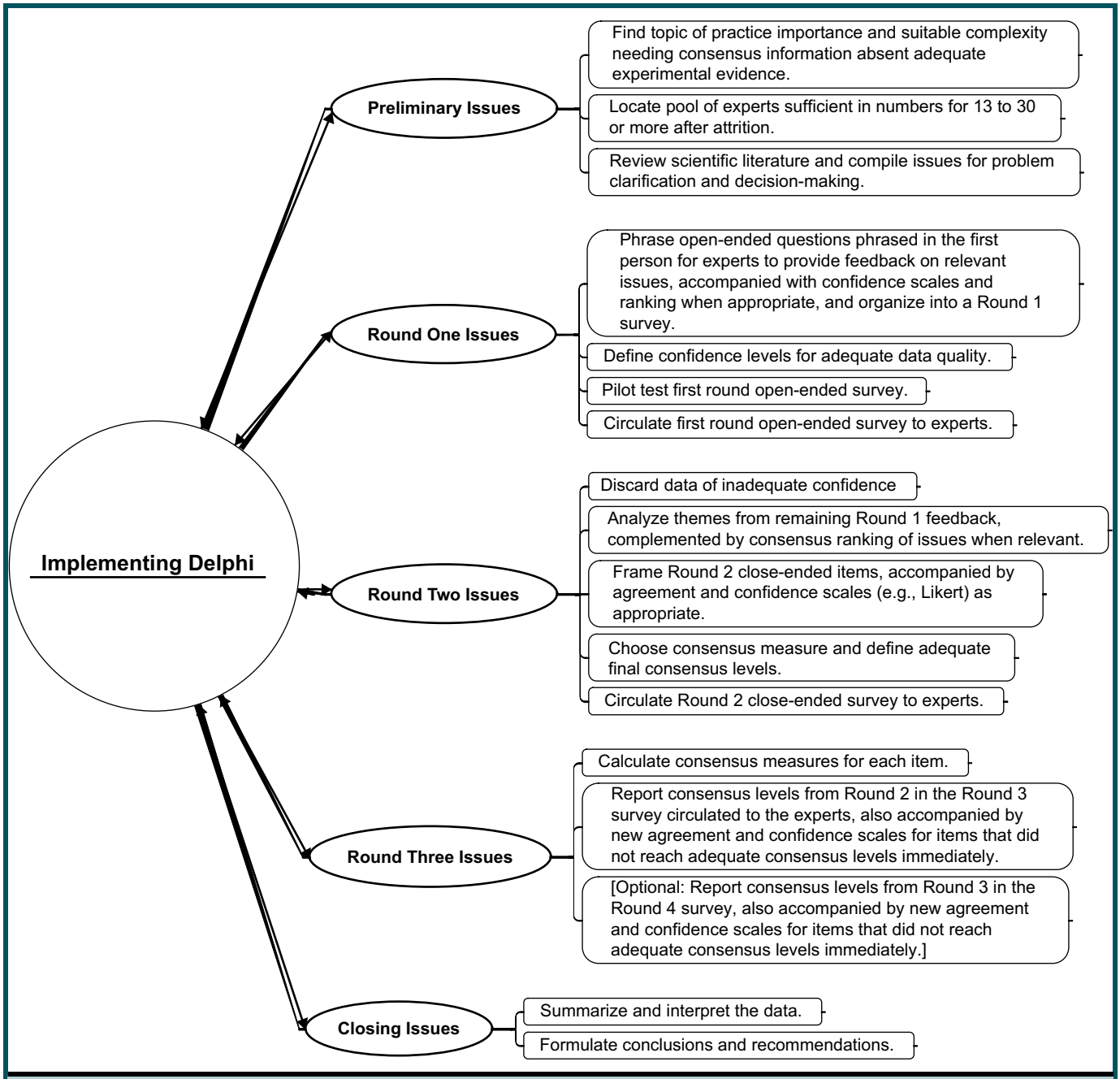

Figure 1. Implementation of the Delphi Process

that the process of iteration itself may be playing a part in allowing panelists to reconsider their original thoughts and move their own opinions closer to a reconsidered, final consensus. Hill and Fowles[34] note that concurrence may be attributable to "bandwagon" and "fatigue" effects as well as reasoned consideration of arguments. They describe Delphi as a 2-step procedure involving first, an interacting stage seeking to reduce bias of individual judgments, and then 1 or more stages with feedback.[10]

Delphi reliability may increase with the number of rounds, and an early school of thought advocated 3 Delphi close-ended item rounds in addition to an initial open-ended survey of the experts.[7] However, respondent fatigue can set in after 2 or 3 close-ended rounds and some authors suggest that close-ended rounds beyond 2 may not result in any advantage.[9,16,35,36] Fink et al[7] also appear to concur with the statement of Sweigert and Schabacker[27] that "if ranking is the major concern, one [close-ended] round may be enough." Thus, some

A An example of an open-ended, eg, classical round 1, Delphi item.

#111. If I used overnight bite guards to treat temporomandibular disorders I would expect to see these positive and/or negative outcomes:	
SUGGESTED FACTOR:	**Estimated importance of outcome to patient (Ranking 1 = Highest, 5 = lowest):**
(From respondent #1): Reduced Pain	1
(From respondent #1): Improved function	3
Blank to be filled with data from respondent	Blank to be filled with data from respondent
Etc.	Etc.

Integration of these and other responses from all respondents would suggest round 2 items such as:

B Examples of close-ended, eg, classical round 2, 3, or 4, Delphi items.

#211. I agree that the use of mouth guards to treat temporomandibular disorders would reduce patient pain.

My feelings about the last statement are [circle a number]:

I disagree very strongly 1 2 3 4 5 6 7 *I agree very strongly*

My confidence level in expressing this opinion is:

I am very uncertain 1 2 3 4 5 6 7 *I am very certain*

#212. I agree that the use of mouth guards to treat temporomandibular disorders would improve patient masticatory function.

My feelings about the last statement are [circle a number]:

I disagree very strongly 1 2 3 4 5 6 7 *I agree very strongly*

My confidence level in expressing this opinion is:

I am very uncertain 1 2 3 4 5 6 7 *I am very certain*

#213. *Etc.*

Figure 2. Examples of one type of classical rounds 1 and 2 Delphi items

modern Delphi studies omit the third close-ended round to reduce respondent fatigue.

One early assumption was that group consensus would tend to be more conservative than individual opinion. However, subsequent observations have tended to demonstrate that groups tend to be upwardly biased, or more optimistic than individuals—a phenomenon termed "risky shift." However, the data for this hypothesized group dynamic of "risky shift" remain controversial.[35]

Variable numbers of participants have been suggested with ranges from 13 up to 60 providing adequate representation.[11,16] Large groups also facilitate often-desirable cross-impact analyses that may help in identifying interacting variables or potential confounders.[9,35] Others assert that Delphi reliability increases with the size of the group, but warn that too large a group creates difficulty in management.[7]

Delphi helps to develop consensus of opinion without inconvenient face-to-face meetings. Consensus provides the potential to guide complex areas of oral health care where level 1 evidence based on large multicenter randomized study data is not available or not feasible given the nature of the research question (eg, the cost and time involved in producing well-designed studies with adequate power, and/or ethical issues in control populations).

As with any methodology, the Delphi process also has some challenges. Consensus results may be "lowest common denominator" rather than "cutting edge."[10,37] Peer pressure may not be completely eliminated.[38] While access to adequate numbers of qualified participants is improved, a Delphi process may sometimes become more expensive, time-consuming, or at a slight performance disadvantage in comparison with competitive methods, eg, nominal group technique.[7] The degree of reliability and validity is difficult to prove, given practical constraints in comparison and assessment.[10]

The internal and external validity of Delphi studies may be limited by biases associated with expert invitation and acceptance, their recall and mental availability, wishes to please or avoid embarrassment, and information sharing before or during the study.[39,40] Increasing the number of options available for decisions in a survey or clinical

TABLE 2. Examples of issues not yet addressed that would be suitable for Delphi

Delphi would obtain consensus on:	Example(s)	In association with the the field(s) of:
• Indications for using	• Bone grafting	• Oral Surgery • Periodontology • Implantology
• Assessing the value of	• Arthrocentesis	• Oral medicine
• Best choices for	• Temperomandibular disorder muscle relaxants	
• Criteria for minimizingand/or	• Bisphosphonate necrosis	
• Criteria for managing	• Orofacial pain syndromes such as burning mouth syndrome. • Mucositis	
• Factors relevant to formal clinical decision making	• Multiple topics	• Many fields

problem can also increase the probability of participants "maintaining the status quo, selecting a default option, or delaying the decision."[41] Hill and Fowles[34] suggest that the Delphi panel should contribute to the phrasing for many event statements if the experimenter is going to avoid potential phrasing bias in the survey and eventual findings. The need to eliminate bias is underlined by the finding that Delphi technique when abused through fraudulent manipulation of statistical feedback between iterations will influence responses in the direction of the bias introduced.[42]

Kahneman and Tversky[43] believe that frequency judgments and probability judgments can be susceptible to large and systematic biases. Shafer[44] also implies that an assumption that a respondent has used Bayesian logic could lead to interpretation bias, as this is not the way caregivers typically think. Thus, Delphi surveys involving these modalities are not encouraged.

Cognitive biases in interpretation exist. Genest and Zideck[45] suggest that the challenge of the theory of combining subjective opinion data is that it is not always clear when a given situation calls for compromise, summarization, or consensus. They suggest that combination of opinion should be guided by the decision context. Moreover, Rowe et al[10] questioned the research base for equating confidence in assessment with relative expertise and Cramer et al[46] observed that the use of confidence as a surrogate for data quality depends on respondent conscientiousness.

All of the above notwithstanding, experts apparently are less influenced by these cognitive biases when dealing within their specialty.[47,48] The group dynamic of Delphi or other formal consensus procedures often produces more accurate conclusions than those of single experts[5,9] or nontrial study designs.

CONCLUSIONS

The uses of Delphi are many. This methodology has been used to improve the quality of existing opinion about specific clinical, educational, and policy problems in periodontics, prosthodontics, pedodontics, oral radiography, restorative dentistry, and oral medicine. It has also been used to provide direction for future research and to provide exploratory data on a range of issues including ethics, particularly in the context of infrequently seen clinical problems. Many issues not yet addressed would be suitable for Delphi, some of which are listed in Table 2.

Research questions for Delphi should be carefully considered and suitable for the technique. A balance should be struck between the desired scope of the objectives and the time and effort entailed in the study. Care is indicated when fulfilling goals of adequate quality of expert sample, framing of questions, and interpretation of data. Based on this literature review, it appears that Delphi is now the most popular consensus method because of the need and value of obtaining consensus opinions and may be applied to evaluate clinical, educational, and policy issues in oral health care.

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